# MODIFIED HIGH EFFICIENCY VIDEO CODING FOR LOW RESOLUTION VIDEOS

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**Abstract**- Video coding standards are rapidly evolving with the advance of the video compression techniques. As the state of the art video coding standard, H.264/AVC exhibits superior coding performance improvement over its predecessors. To meet the industry requirement of standardizing existing video techniques, video coding standards were developed by two international organizations, ITU-T and ISO/IEC. the state of art video coding standard H.264/AVC, jointly developed by ITU-T Video Coding Experts Group (VCEG) and ISO/IEC Moving Picture Experts Group (MPEG), is reported to achieve gains in compression efficiency up to 50% to its predecessor MPEG-2. In the proposed system we have enhanced the prediction coding for low resolution videos and applied the HEVC coding/compression on the video using intra and inter predictability of the data to be coded our techniques has reduced complex quantization block and thus renders the video data with close precision to the blocks encoded and reduces coding error while maintaining high perceptual quality.

**KEYWORDS-** HIGH EFFICIENCY VIDEO CODING (HEVC), MOVING PICTURE EXPERTS GROUP (MPEG), HUMAN VISUAL SYSTEM (HVS), JOINT VIDEO TEAM (JVT), VIDEO CODING EXPERTS GROUP (VCEG), HIGH DEFINITION (HD) AND ULTRA HIGH DEFINITION (UHD

## INTRODUCTION

Nowadays, we assist to the massification of digital video in several multimedia applications [1]. Although video compression and streaming have experienced phenomenal growth since the introduction of first video compression methods and commercial streaming products, there still remain many challenges to be addressed to achieve resilient and efficient video delivery over unreliably varying environments like the Internet and wireless channels. The difficulty comes from the fact that both channel characteristics and video content vary in time which requires adaptation of encoding and streaming techniques to network and video content. Digital video coding plays a big role in this phenomenon, as it provides the necessary data compression to allow the transmission and storage of digital video contents in the currently available supports and networks. However, with the increasing presence of high and ultra high definition video contents resultant from the continuous advances in video capturing and display technologies, the current state-of-the-art video coding standard, the H.264/AVC standard, does not seem to provide the required compression ratios needed for their transmission and storage in the currently available facilities [2]. This fact has led to the need of new video coding tools that can provide further compression efficiency regarding the H.264/AVC state-of-the-art. As an answer to these needs, the ITU-T VCEG and ISO/IEC MPEG standardization bodies have started a new video coding standardization project called High Efficiency Video Coding (HEVC) targeting the reduction of the coding rates in 50% for the same quality [3].

Digital video has been a regular presence in our lives for many years now. Whether used for digital television, in personal computers, hand held devices or other multimedia applications, its use has grown tremendously in the last years and it seems that this growth is not slowing down. With the currently available transmission and storage supports, this growth is only possible with the use of powerful compression tools allowing the reduction of the number of bits needed to represent the video content by exploiting the data correlation and the limitations of the Human Visual System (HVS) to remove the redundant and irrelevant data, respectively. These compression tools have been included in several video coding standards defined by the International Telecommunication Union – Telecommunication Standardization Sector (ITU-T) and the Moving Picture Experts Group (MPEG) over the last two decades [4]. Currently, the H.264/AVC coding standard,

developed by the Joint Video Team (JVT) formed by the ITU-T Video Coding Experts Group (VCEG) and ISO/IEC MPEG bodies, is considered the state-of-the-art in terms of video coding.

However, with the recent advances in video capturing and display technologies, the presence of High Definition (HD) and Ultra High Definition (UHD) video contents in various multimedia applications is quickly increasing. Clearly, this type of video resolutions requires higher bandwidth for its transmission and larger storage capacities. In this way, the compression ratios achieved by the current state-of-the-art video coding standard for HD and UHD content do not seem enough taking in account the available transmission and storage supports. With this in mind, the ITU-T VCEG and ISO/IEC MPEG bodies created the Joint Collaborative Team on Video Coding (JCT-VC) which is currently developing a new video coding standard, the High Efficiency Video Coding (HEVC) standard, with the objective of increasing the highest available compression ratios, particularly for very high resolution video contents [5]. To do this, new coding techniques have to be developed that can guarantee better compression over the current ones even if at the price of some additional complexity.

## DIGITAL VIDEO

Digital video is video information represented in digital form. Digital representation has a number of key advantages over "traditional" analogue video and television. All information can be represented in digital form and so the same techniques and systems can be used to store, process and transmit a wide range of different types of data (multiple media or "multimedia"). The rapid growth in digital processing power means that complex processing and coding operations can be carried out on digital video data in real time and that video can be integrated into computer applications and systems [5]. This in turn makes it possible to create interactive applications, where the user is no longer a "passive" observer but has the opportunity to interact with the video information.

Advances in data networking technology have matched advances in computing and processing capabilities. In a short space of time, the number of computers and systems connected by networks such as the Internet has grown exponentially. As well as becoming more widespread, networks can handle higher volumes of data and higher transmission rates. The current networking structure is loosely defined and "heterogeneous" (consisting of a range of interconnected networks with different technologies and capabilities).

Digital video has an inherently high bandwidth, i.e. a digitised video signal requires a very high data rate for transmission, which means that in order to store and transmit this information effectively it has been necessary to develop techniques for compressing the video data (i.e. encoding it into a smaller number of bits). International Standards for encoding video data have enabled a wide range of applications that make use of digital video transmission and storage. Image coding provides a means of compressing digitised photographic images by around 10 to 20 times whereas techniques for coding motion video enable video data to be compressed by between 20 and more than 50 times. By using these techniques it has become practical to store, transmit and manipulate digital image and video information using currently available storage systems and data networks.

A video signal represented in digital form requires a relatively high bitrate. For example, a single digital television signal in CCIR 601 format [6] requires a transmission rate of 216 Mbps. This is unacceptably high for most practical purposes. There is a need to reduce this data rate before digital television and video can be integrated into existing and emerging communication systems. This means that the digital video information must be compressed (encoded) prior to transmission and decompressed (decoded) before displaying it at the receiver. A number of video coding techniques and standards have been developed within the last few years which exploit some of the inherent redundancy in still images and moving video sequences in order to provide significant data compression [7]. Some compression can be achieved by exploiting the statistical redundancy within the data. For example, video data is often highly correlated both spatially and temporally. This redundancy can be removed by coding the data in a more efficient way. Compression of this nature does not destroy any of the original data and is hence a reversible process (lossless compression). In order to achieve higher levels of compression it is necessary to remove subjectively redundant information. This is information which is not visually obvious to the viewer and which can be removed without severely reducing the quality of the signal. This type of compression destroys some of the original image information that cannot later be recovered (lossy compression).

Coding techniques can be grouped into two main classes: still image coding and motion video coding. Still image coding exploits the spatial redundancy within images. Motion video coding takes into account temporal as well as spatial redundancy.

## HISTORY

Major milestones in the evolution of video coding standards are the well-known H.262/MPEG-2 Video [8] and H.264/MPEG-4 Advanced Video Coding (AVC) [9] standards, the development of which was coordinated by the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Pictures Expert Group (MPEG). The first version of the H.264/MPEG-AVC standard (and its reference software JM [10]) was developed in the period between 1999 and 2003 to satisfy the growing need for higher coding efficiency, especially with regard to standard-definition TV and video transmission over low data rate channels.

As a result, the H.264/MPEG-AVC standard successfully

achieved an increase of about 50% in coding efficiency compared to its predecessor H.262/MPEG-2 Video. H.264/MPEG-AVC was designed for both low- and high bit-rate video coding in order to accommodate the increasing diversification of transport layers and storage media. In turn, this gave rise to a wide variety of H.264/MPEGAVC- based products and services [9], [11]. Throughout subsequent stages of development, additional efforts were made (mainly from 2003 to 2009) for further improving the coding efficiency as well as for integrating additional functionalities and features into the design of H.264/MPEGAVC by means of the so-called Fidelity Range Extensions (FRExt) with its prominent High profile, the Scalable Video Coding (SVC) extension and finally, the Multiview Video Coding (MVC) extension.

As already noted above, H.264/MPEG-AVC provided significant bit-rate savings compared to H.262/MPEG-2 Video. However, both video coding standards, at least their first editions, were not initially designed for High Definition (HD) and Ultra High-Definition (UHD) video content, the demand for which is expected to dramatically increase in the near future (Note that the term UHD often refers to both 3840x2160 (4K) or 7680x4320 (8K) resolutions in terms of luma samples).

As a consequence, ITU-T VCEG and ISO/IEC MPEG established a Joint Collaborative Team on Video Coding (JCT-VC) and issued a joint call for proposals (CfP) on video coding technology in 2010. In response to this CfP, a lot of proposals were submitted both from representatives of industry and academia, which in turn led to an intensive development of the so-called High-Efficiency Video Coding (HEVC) standard during the next two and the half years. The first edition of HEVC was officially finalized in January 2013, and after that, the final aligned specification was approved by ITU-T as Recommendation H.265 and by ISO/IEC as MPEG-H, Part 2 [12]. The H.265/MPEG-HEVC standard was designed to be applicable for almost all existing H.264/MPEG-AVC applications, while putting emphasis on high-resolution video coding. Since the development process of H.265/MPEGHEVC was also driven by the most recent scientific and technological achievements in the field of video coding, dramatic bit-rate savings were achieved for substantially the same visual quality, when compared to its predecessor like H.264/MPEG-AVC [13],[14].

Future extensions of HEVC, which are already being explored and prepared by the JCT-VC's parent bodies, are likely to include extended-range formats with increased bit depth and enhanced color component sampling, scalable coding, and 3-D/stereo/multi-view video coding (the latter including the encoding of depth maps for use with advanced 3-D displays).

## PROBLEM OBJECTIVE

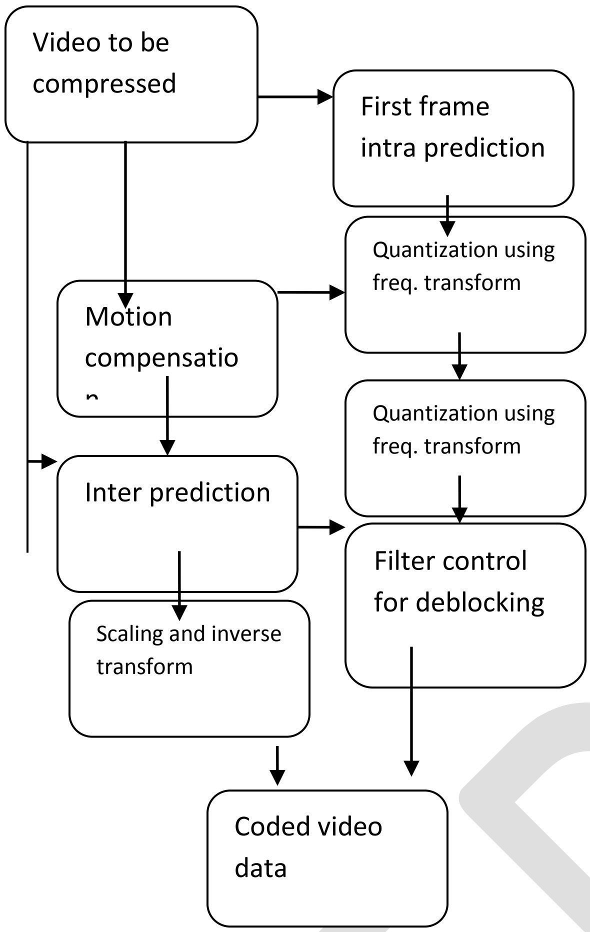
Problem with previous approach were the compression and coding on the high bandwidth data and high level coding for HD content. These codec involve HR data to be coded and decoded, as the loss is high. We, are trying to reduced the loss due to compressive coding of the data by reducing the minimum prediction for compression between H264 and HEVC codes. The main problem is the number of prediction coding for the video data to be compressed. We have solved it by adaptive strategy, which is based on the compression of LR video data.

## PROPOSED SCHEME

The proposed system works on the basis of intra prediction and firstly encodes the first frame with a blind intra motion prediction is for first frame and all the other frames are compressed on the basis of the first frame prediction and motion estimation the consecutive frames are predicted on the basis of this dependent prediction we get the regions for compression and then predict the block size of the compression unit.

International Journal of Engineering Research and General Science Volume 3, Issue 4, Part-2, July-August, 2015
ISSN 2091-2730

**BLOCK DIAGRAM**




**RESULTS**

The below given frames are rendered with the reduced prediction HEVC coding and also the results for 30 frame video data, we have calculated the BER and PSNR change in the data of coded videos

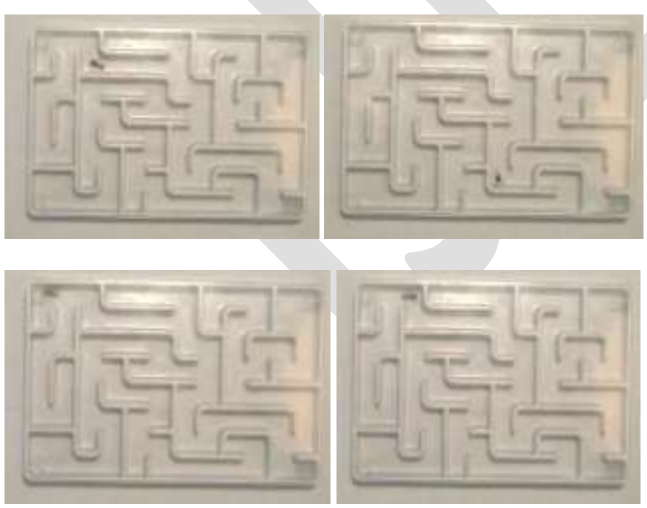


Figure shows the blindly encoded LR video frames data

| frame | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| psnr | 27.559 | 27.816 | 27.918 | 27.077 | 28.317 |

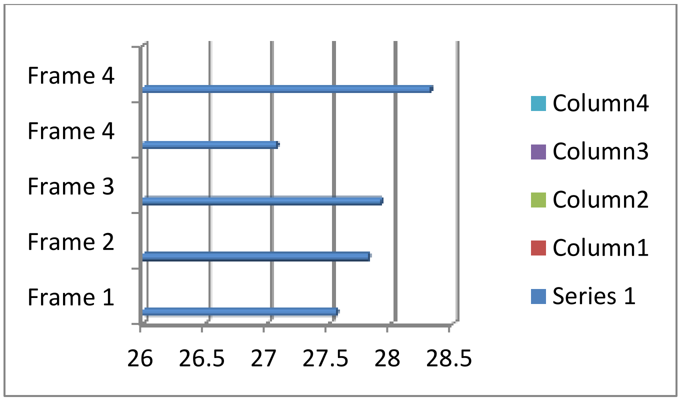



Figure 2 shows the psnr values of rendered 200x200 video under HEVC

| frame | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| corr | 0.9 | 0.94 | 0.94 | 0.95 | 0.95 |

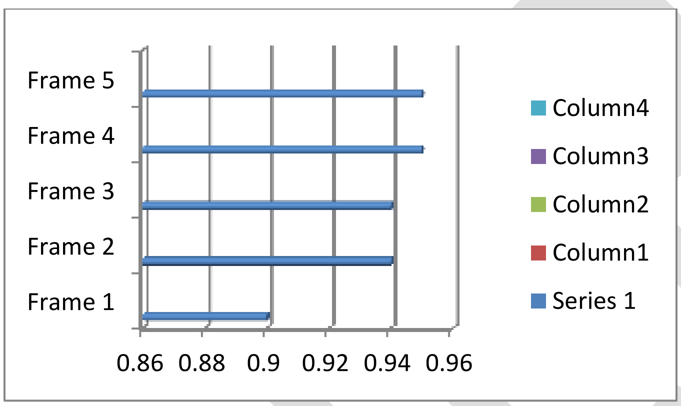



Figure 3shows the Corelation values of rendered 200x200 video under HEVC

## CONCLUSION

As from the above system analysis we can conclude the efficiency of the system is high as the PSNR rate of the rendered is quite high which is well correlated with the 45 db perceptual mark and applied code rendering has no significant effect on the bit rate error according to correlation values which are well above 0.9 mark. However this technique is not fully accurate and we will increase the prediction blocks for the sys in order to increase the coding capacity by measuring compression ratio and bit encoding.

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